Attachment 1-4

A N A L Y T I C A L R E P O R T

900195

FOR

Ethyl Petroleum Additives
Denis Lenane
20 South 4th Street
St. Louis, MO 63102-1886

03/05/90

Western Atlas International

CORE LABORATORIES

Western Atlas International
A Litton/Dresser Company

CORE LABORATORIES

LABORATORY TESTS RESULTS
03/05/90

JB NUMBER: 900195 CUSTOMER: Ethyl Petroleum Additives ATTN: Denis Lenane

AMPLE NUMBER: 1 DATE RECEIVED: 02/28/90 TIME RECEIVED: 15:12 SAMPLE DATE: 02/23/90 SAMPLE TIME: 15:12
ROJECT: Sample No. Red MMT Atl SAMPLE: Sample No. Red MMT Atl. REM: 1x1 gal can

AMPLE NUMBER: 2 DATE RECEIVED: 02/28/90 TIME RECEIVED: 15:12 SAMPLE DATE: 02/23/90 SAMPLE TIME: 15:12
ROJECT: Sample No. Green EEE Atl. SAMPLE: Sample No. Green EEE Atl. REM: 1x1 gal can

AMPLE NUMBER: 3 DATE RECEIVED: 02/28/90 TIME RECEIVED: 15:12 SAMPLE DATE: 02/27/90 SAMPLE TIME: 15:12
ROJECT: Sample No. B Pump ECS Lab MMT SAMPLE: Sample No. B Pump ECS Lab MMT REM: 1x1 gal can

AMPLE NUMBER: 4 DATE RECEIVED: 02/28/90 TIME RECEIVED: 15:12 SAMPLE DATE: 02/27/90 SAMPLE TIME: 15:12
ROJECT: Sample No. EEE Pump ECS Labs SAMPLE: Sample No. EEE Pump ECS Labs REM: 1x1 gal can

EST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4			UNITS OF MEASURE
ydrocarbons Type, FIA	FIA	FIA	FIA	FIA			L.V.%
Aromatics	27.9	28.1	28.4	29.9			L.V.%
Olefins	1.0	1.0	1.3	1.4			L.V.%
Saturates	71.1	70.9	70.3	68.7			L.V.%
Total Sulfur by Microcoulometry	49	48	57	54			ppm wt
Vapor Pressure, Reid	8.7	8.75	8.85	8.7			PSI
Engler Distillation (D-86)	D-86	D-86	D-86	D-86			Deg. F
Initial Boiling Point	79	81	79	80			Deg. F
05% Evaporated Temperature	103	111	105	106			Deg. F
10% Evaporated Temperature	125	129	127	127			Deg. F
20% Evaporated Temperature	154	157	157	157			Deg. F
30% Evaporated Temperature	180	183	184	185			Deg. F

ED BY: Michele B. Steele

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ROJECT: Sample No. EEE Pump ECS Labs SAMPLE: Sample No. EEE Pump ECS Labs REM: 1x1 gal can

EST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4			UNITS OF MEASURE
0% Evaporated Temperature	203	205	205	205			Deg. F
0% Evaporated Temperature	217	218	218	218			Deg. F
50% Evaporated Temperature	228	229	228	228			Deg. F
70% Evaporated Temperature	239	241	238	238			Deg. F
90% Evaporated Temperature	258	261	256	254			Deg. F
0% Evaporated Temperature	305	308	303	300			Deg. F
5% Evaporated Temperature	335	339	332	331			Deg. F
nd Point	395	398	383	384			Deg. F
% Overhead Recovery	96.9	97.4	97.0	97.0			%
% Residue	1.0	1.3	1.1	1.1			%
% Loss	2.1	1.3	1.9	1.9			%
Research Octane Method(Gasoline)	96.9	96.0	97.9	97.0			0.1 Octane No.

AP ED BY: Michele R. Stacy

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LABORATORY TESTS RESULTS
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JOB NUMBER: 900195 CUSTOMER: Ethyl Petroleum Additives ATTN: Denis Lenane

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PROJECT: Sample No. 8 Pump ECS Lab MMT SAMPLE: Sample No. 8 Pump ECS Lab MMT REM: 1x1 gal can

SAMPLE NUMBER: 4 DATE RECEIVED: 02/28/90 TIME RECEIVED: 15:12 SAMPLE DATE: 02/27/90 SAMPLE TIME: 15:12
PROJECT: Sample No. EEE Pump ECS Labs SAMPLE: Sample No. EEE Pump ECS Labs REM: 1x1 gal can

TEST DESCRIPTION	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4			UNITS OF MEASURE
Motor Octane Method(Gasoline)	87.7	87.5	88.3	88.0			0.1 Octane No.
(Research + Motor)/2	92.3	91.8	93.1	92.5			
Lead in Gasoline by AA	0.003	0.003	0.003	0.003			g/gal
Manganese in Gasoline by AA	0.036	<0.001	0.034	<0.001			g/gal

APPROVED BY: Nicole K. Stuetz

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Attachment 1-5

ECS LABORATORIES, INC.

MILEAGE ACCUMULATION ROUTE

LOCATION OF TURN	LOCATION OF SPEED CHANGE	ODOMETER	SPEED LIMIT (MPH)
ECS LABORATORIES (START) SOUTH		0.0	25
PLYMOUTH ROAD WEST		0.5	40
	ENTERING BUSINESS AREA	2.7	35
MAIN STREET SOUTH		3.4	25
	ANN ARBOR TRAIL	4.9	35
JOY ROAD EAST		5.4	40
HAGGERTY ROAD NORTH		6.7	35
ANN ARBOR TRAIL EAST		7.7	35
INKSTER ROAD SOUTH		14.9	40
FORD ROAD EAST		16.5	40
OUTER DRIVE NORTH			
WARREN ROAD EAST		20.7	35
EVERGREEN ROAD NORTH		21.8	30
OUTER DRIVE EAST		26.2	35
6-MILE ROAD EAST		27.7	35
SOUTHFIELD EXPRESSWAY SOUTH		28.4	55
I-96 WEST		30.9	55
I-275/96 NORTH		42.2	55
M102 SOUTH/EAST		49.2	55
FARMINGTON EXIT AT 9-MILE ROAD EAST		51.5	35
FARMINGTON ROAD NORTH		51.8	35

centrations for each job position resulted in a correlation coefficient of 0.12. Thus there is very poor correlation between manganese exposure and manganese excretion in the urine. In Case 5, the Hot Blastman position, the manganese-in-air concentration was the second lowest exposure measured, yet the urine excretion of manganese (24-hour sample) was the only one to exceed normal prior to EDTA administration. Cholak[9] also states that the mean average for a group of unexposed individuals was 2 μg/liter with a range of 1 μg/liter to 7 μg/liter. The higher mean in our unexposed group (7 μg/liter) may be due to the fact that all steel workers in this plant may be exposed to slightly higher background levels than the normal population. Background atmospheric manganese concentration levels in the areas where the control group was located range from .001 to .025 mg/cu m. Finally, it must be recognized that fundamentally the bile is the primary metabolic pathway for excretion of manganese and the urine cannot very well be expected to reflect occupational exposure accurately. This is doubly apparent when we see manganism develop in the presence of normal urine manganese concentrations.

Equally lacking in correlation are blood manganese concentrations and exposure. The average manganese blood level of our exposed employees was the same as that of the unexposed group.

The development of manganism in one employee having a low exposure to manganese oxide fume (Case 5) suggests the possibility of hypersusceptibility of certain individuals inasmuch as others in similar positions and with equal or greater exposure did not develop manganism. This phenomenon is well known in toxicology. Unknown and unrecognized exposure away from the job site is another possibility. In any event, this case lends stress to the value of periodic physical examinations rather than examinations of biologic materials to detect early evidence of signs of manganism.

Conclusion

Although parkinsonism and manganism are indistinguishable, the detection of five cases among persons having an occupational manganese exposure, and in an age group in which parkinsonism is not expected, justifies the presumption of a causal relationship. The mobilization and excretion of large amounts of stored manganese after treatment with Calcium EDTA supports this presumption.

References

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5. Henderson Y, Haggard HW: *Noxious Gases and the Principles of Respiration Influencing Their Action*. New York, Reinhold Publishing Co, 1943.

6. Whitlock CM et al: Chronic neurological disease in two manganese steel workers. *Amer Indust Hyg Assoc J* 27:454-459, 1966.

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9. Cholak J: The metals, in Patty FA: *Industrial Hygiene & Toxicology*, ed 2. New York/London, Interscience Publishers, vol 2, 1963.

The authors are indebted to Sidney Goldblatt, MD and Samuel Bradley, MD of Johnstown, Pa for their able assistance in the clinical phase of this study.

*Threshold Limit Value: The maximum, average, atmospheric concentration of contaminant to which workers may be exposed for an eight-hour working day.

†Ceiling Value: A calculated value which may not be exceeded at any time; usually assigned to substances having a threshold limit value with little or no safety factor.

‡EDTA: Calcium Ethylene Diamine Tetra-acetic Acid. A chelating agent chemically binding the manganese into a form excretable by the kidneys.